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AUTHOR Pomeroy, James W.; And Others
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ABSTRACT

The general purpose of the occupational analysis is to provide workable, basic information dealing with the many and varied duties performed in the television and radio service occupation. The document opens with a brief introduction followed by a job description. The bulk of the document is presented in table form. Eight duties are broken down into a number of tasks and for each task a two-page table is presented, showing on the first page: tools, equipment, materials, objects acted upon; performance knowledge (related also to decisions, cues and errors); safety--hazard; and on the second page: science; math--number systems; and communications (performance modes, examples, and skills and concepts). The duties include: repairing phonographs, tape recorders, AM and FM radios, and wireless intercommunication sets; servicing television sets; and installing and repairing TV antenna systems and wired intercommunication systems. Lists of basic radio-TV repair hand tools and equipment for a radio-TV standard bench are appended. (BP)

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Occupational Analysis

CE 004 198

TELEVISION AND RADIO SERVICE TECHNICIAN

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Instructional Materials Laboratory
Trade and Industrial Education
The Ohio State University
5216

AN ANALYSIS OF THE TELEVISION AND RADIO SERVICE OCCUPATION

Developed By

James W. Pomeroy
Instructor, Electricity
Patterson Cooperative High School
Dayton, Ohio

Joe Swincher
Instructor, Electronics
Central High School
Columbus, Ohio

Jay L. Caldwell
Consultant
R.C.A. Electronics
Columbus, Ohio

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Coordinator: William L. Ashley

The Instructional Materials Laboratory
Trade and Industrial Education
The Ohio State University

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FOREWORD

The occupational analysis project was conducted by The Instructional Materials Laboratory, Trade and Industrial Education, The Ohio State University in conjunction with the State Department of Education, Division of Vocational Education pursuant to a grant from the U.S. Office of Education.

The Occupational Analysis project was proposed and conducted to train vocational educators in the techniques of making a comprehensive occupational analysis. Instructors were selected from Agriculture, Business, Distributive, Home Economics and Trade and Industrial Education to gain experience in developing analysis documents for sixty-one different occupations. Representatives from Business, Industry, Medicine, and Education were involved with the vocational instructors in conducting the analysis process.

The project was conducted in three phases. Phase one involved the planning and development of the project strategies. The analysis process was based on sound principles of learning and behavior. Phase two was the identification, selection and orientation of all participants. The training and workshop sessions constituted the third phase. Two-week workshops were held during which teams of vocational instructors conducted an analysis of the occupations in which they had employment experience. The instructors were assisted by both occupational consultants and subject matter specialists.

The project resulted in producing one hundred two trained vocational instructors capable of conducting and assisting in a comprehensive analysis of various occupations. Occupational analysis data were generated for sixty-one occupations. The analysis included a statement of the various tasks performed in each occupation. For each task the following items were identified: tools and equipment; procedural knowledge; safety knowledge; concepts and skills of mathematics, science and communication needed for successful performance in the occupation. The analysis data provided a basis for generating instructional materials, course outlines, student performance objectives, criterion measures as well as identifying specific supporting skills and knowledge in the academic subject areas.

PREFACE

The approach in performing this task analysis was to orient thoughts on a plane so as to include as many equipment-oriented tasks as possible. By limiting the analysis to common methods of electronic servicing the sub-task list is limited to those items that an employer expects his/her employees to be able to do. The basic motor skills expected of a mechanic (e.g. using hand tools) are not included.

General knowledge requirements for an understanding of basic electronics theory are assumed and only the specific areas of science required for the performance of a task are referenced.

The detail requirements for successful performance of a task are outlined with emphasis being placed on one's ability to read and interpret manufacturer's technical data and to perform schematic analysis.

There are no supervisory duties included in this analysis.

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The Ohio State University
Columbus, Ohio

Jodi Beittel, Communications
Columbus, Ohio

Diana L. Buckeye, Mathematics
University of Michigan
Avon Lake, Ohio

Rick Fien, Chemistry
The Ohio State University
Beachwood, Ohio

N.S. Gidwani, Chemistry
Columbus Technical Institute
Columbus, Ohio

Bruce A. Hull, Biology
The Ohio State University
Columbus, Ohio

Donald L. Hyatt, Physics
Worthington High School
Worthington, Ohio

Glenn Mann, Communications
Columbus, Ohio

Jerry McDonald, Physical Sciences
Columbus Technical Institute
Reynoldsburg, Ohio

Colleen Osinski, Psychology
Columbus Technical Institute
Columbus, Ohio

David Porteous, Communications
University of Connecticut
Colchester, Connecticut

James A. Sherlock, Communications
Columbus Technical Institute
Columbus, Ohio

Jim VanArsdall, Mathematics
Worthington High School
Worthington, Ohio

Lillian Yontz, Biology
The Ohio State University
Caldwell, Ohio

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Peg Bushelman	Typist
Carol Fausnaugh	Typist
Mindy Fausnaugh	Typist
Rita Hastings	Typist
Carol Hicks	Typist
Sue Holsinger	Typist
Barbara Hughes	Typist
Carol Marvin	Typist
Patti Nye	Typist
Kathy Roediger	Typist
Mary Salay	Typist

JOB DESCRIPTION

Television and radio service technicians install and repair home electronic entertainment products. These products include television, radios, phonographs, high-fidelity and stereophonic sound equipment, intercommunication equipment, tape recorders, etc.

The service technician's job is to check and evaluate each possible cause of trouble, repair or replace defective parts, perform alignments and make adjustments.

Service technicians must be able to use basic hand tools, read and interpret schematic diagrams and other technical data, make electrical checks with test instruments, evaluate test results, estimate and compute cost of repairs, and practice good customer relations.

Duty A Repairing Phonographs

1 Make preliminary repair estimate (phonographs)
2 Repair changer mechanism
3 Repair power supply
4 Repair audio amplifier

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(TASK STATEMENT) MAKE PRELIMINARY REPAIR ESTIMATE (PHONOGRAPHS)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY -- HAZARD
Radio-TV repair hand tool list (see index 1) Test record	Verify customer complaint Analyze performance through observation and manipulation of controls Compute estimated cost of repair	Hazard: Electrical shock-electrical burn Possible heat burns Safety: Avoid direct contact with any voltage source Avoid direct contact with hot component

DECISIONS	CUES	ERRORS
Estimate cost of parts and labor	Improper indexing Improper tracking Improper speed Improper audio output	Large discrepancy between estimate and actual cost

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(TASK STATEMENT) MAKE PRELIMINARY REPAIR ESTIMATE (PHONOGRAPHS)

SCIENCE	MATH – NUMBER SYSTEMS
Changer mechanism mechanics Audio amplifier electronics Power supply electronics Principles of interaction of circuitry	Addition and subtraction of decimal fractions [cost estimate] Multiplication and division of decimal fractions [cost estimate] Measure of length [record speed, RPM] Finding a percent of a number and what percent one number is of another [profit mark-up] Measures of weight [stylus pressure, grams]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Information from customer Interpret repair warranty	Comprehension, information report, description of mechanism
Writing	Estimated cost of repairs	Classification, description, terminology
Speaking	Recommend alternative to repairs Explain repair warranty	Terminology, enunciation, persuasion and sales technique, logic, poise, usage

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(TASK STATEMENT) REPAIR CHANGER MECHANISM

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench multimeter battery eliminator Spring puller Spline wrenches Stylus pressure gage Stroboscope disc Test record 100-OHM, 10-watt resistor (for 90 v. motor)	Performance test and troubleshoot Repair and adjust drive system Repair or replace cartridge Replace needles Repair or replace motors Adjust change cycle Repair and adjust trip mechanism Repair and adjust shut-off system Repair and adjust record dropping system Repair and adjust tone arm Lubricate moving parts	Hazard: Electrical shock from exposed wiring Heat burns - hot components Safety: Avoid direct contact with any voltage Avoid direct contact with hot components

DECISIONS	CUES	ERRORS
Select replacement parts Determine proper operation Select appropriate data	Improper indexing, tracking, speed or change cycle Does not shut-off Distorted or no cartridge output Eratic speed (wow and flutter)	Action fails to correct malfunction Excessive man hours for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR CHANGER MECHANISM

SCIENCE	MATH – NUMBER SYSTEMS
Piezoelectric effect Induced voltage and current Simple machines used to gain mechanical advantage [levers, gears, pulleys] Work input, work output, friction and efficiency in simple machines [accumulated wear] Effect of heating and cooling on expansion of materials [loss of speed] Magnetic fields of force [magnetic cartridge] Centripetal forces developed by bodies in rotation [tracking] Transfer of energy from one form to another [mechanical to electrical] Inertia and momentum [flywheel effect] Motion resulting from two or more forces acting on a point in a body [in mechanism operation] Effects of friction on work processes and product quality [stylus wear, mechanism wear] Relationship of force to distortion in an elastic bo' [springs]	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [multi-meter] Addition and subtraction of decimal fractions [cost of repairs] Multiplication and division of decimal fractions [cost of repairs] Measures of length [tone arm adjustment, inches] Measure of time and speed [record speed, RPM, strobescope] Measures of weight [stylus pressure, grams]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Instructions from customer Interpret equipment diagrams and specifications Interpret repair warranty	Comprehension, detail/inference, information report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

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(TASK STATEMENT) REPAIR POWER SUPPLY

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter multimeter oscilloscope isolation transformer battery eliminator vacuum cleaner tube tester capacitor substitution box	Selecting appropriate technical data Visually inspect and correct obvious defects Performance test and troubleshoot Identify faulty component(s) Remove and replace faulty conponent(s)	Hazard-personal: Hazardous voltages - electric shock Heat burns - hot component Hazard-equipment: Damage to solid-state devices when soldering Safety-personal: Avoid direct contact with voltage sources Avoid physical contact with heat sources Discharge electrolytic capacitors after removing power Safety-equipment: Dissipate heat from solid state devices when soldering

DECISIONS	CUES	ERRORS
Select replacement parts Determine proper operation	Smoking Hissing Hum Blown fuse Improper voltage No voltage output	Action fails to correct malfunction Excessive labor cost for trouble shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR POWER SUPPLY

SCIENCE	MATH – NUMBER SYSTEMS
Principles of Ohm's law Principles of electric power Solid-state device characteristics Vacuum tube characteristics Filtering principles Half wave rectification Full wave rectification Bridge rectification Magnetic fields of force [inductance] Resistance of materials to flow of electrical current Principles of interaction of circuitry Effect of heating and cooling on expansion of materials [solid-state devices]	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition and subtraction of decimal fractions [cost of repairs] Multiplication and division of decimal fractions [cost of repairs]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams Interpret repair warranty	Comprehension, detail/inference, information report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

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(TASK STATEMENT) REPAIR AUDIO AMPLIFIER

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench multimeter signal generator, audio frequency oscilloscope battery eliminator signal tracer vacuum cleaner tube tester transistor tester capacitor checkers capacitor substitution box resistor substitutition box	Selecting appropriate technical data Visually inspect and correct obvious defects Performance test and troubleshoot Analyze test results Identify faulty component(s) Remove and replace faulty component(s) Correct frequency response defects (tone control)	Hazard-personal: Hazardous voltage - electrical shock Heat burns - soldering iron and components Hazard-equipment: Transistor damage when removing or replacing Transformer damage when load is removed Safety-personal: Avoid direct contact with voltage sources Avoid physical contact with heat sources Safety-equipment: Dissipate heat from solid-state device when soldering Maintain load on output
DECISIONS	**CUES**	**ERRORS**
Select replacement parts Determine proper operation	No output Low volume Distortion Motor boating Noise	Action fails to correct problem Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR AUDIO AMPLIFIER

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on state of matter [solid-state devices] Resistance of materials to flow of electrical current [Principles of transistor amplifiers, principles of ohms law, principles of electric power, principles of vacuum tube amplifiers, vacuum tube characteristics, solid-state devices characteristics, principles of interaction of circuitry] Magnetic fields of force [induction]	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition and subtraction of decimal fractions [cost of repairs] Multiplication and division of decimal fractions [cost of repairs]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Instructions from customer Interpret equipment diagrams and specifications Interpret repair warranty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

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Duty B Repairing Tape Recorders

1 Make preliminary repair estimate (tape recorders)
2 Repair recorder mechanism
3 Repair audio amplifier
4 Repair bias oscillator

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(TASK STATEMENT) MAKE PRELIMINARY REPAIR ESTIMATE (TAPE RECORDERS)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1): Test tape	Verify customer complaint Inspect record/playback mechanism Compute estimated cost of repair Analyze performance through observation and manipulation of controls	Hazard: Electrical shock-electrical burn Possible heat burns Safety: Avoid direct contact with any voltage source Avoid direct contact with hot components

DECISIONS	CUES	ERRORS
Estimate cost of repairs and labor	Record failure Playback failure Improper or no tape speed Faulty microphone Open fuses Abnormal audio	Large discrepancy between estimate and actual cost

(TASK STATEMENT) MAKE PRELIMINARY REPAIR ESTIMATE (TAPE RECORDERS)

SCIENCE	MATH – NUMBER SYSTEMS
Tape drive mechanism mechanic Audio amplifier electronics Record amplifier electronics Record oscillator electronics Power supply electronics Magnetic fields of force [magnetic heads] Principles of interaction of circuitry	Measure of time and speed [tape speed, inches per second] Addition and subtraction of decimal fractions [cost estimate] Multiplication and division of decimal fractions [cost estimate] Finding a percent of a number and what percent on number is of another [profit mark-up]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Information from customer Interpret repair warranty Estimated cost of repairs	Comprehension, informational report, description of mechanism
Writing		Classification, description, terminology
Speaking	Recommend alternative to repairs Explain repair warranty Explain customer control operation to improve quality	Terminology, enunciation, persuasion and sales technique, logic, poise, usage

(TASK STATEMENT) REPAIR RECORDER MECHANISM

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list Radio-TV standard bench: work bench multimeter signal generator, audio frequency vacuum cleaner battery eliminator Test tape Springpuller	Select appropriate technical data Visually inspect and correct obvious defects Performance test and troubleshoot Demagnetise heads Remove and replace heads Clean and lubricate moving parts Check and replace worn parts (belts, pulleys, and gears)	Hazard: Electrical shock from exposed wiring Heat burns - hot components Safety: Avoid direct contact with any voltage Avoid direct contact with hot components

DECISIONS	CUES	ERRORS
Select replacement parts Determine proper operation	Drive failure Tape spillage Tape breaks Machine squeals Speed defective Flutter or wow Magnetic head failures	Excessive labor cost for trouble-shooting Misadjustment of recorder mechanism Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR RECORDER MECHANISM

SCIENCE	MATH – NUMBER SYSTEMS
Magnetic fields of force [magnetic heads] Transfer of energy from one form to another [recording tape] Effects of friction on work processes and product quality [speed of drive mechanism] Relationship of force to distortion in an elastic body [springs (tension)] Simple machines used to gain mechanical advantage [levers, gears] Work input, work output, friction and efficiency in simple machines [accumulated wear]	Measure of time and speed [inches per second] Given an instrument of measure determine precision and/or accuracy with respect to manufacturer's specifications [multi-meter] Addition and subtraction of decimal fractions [cost of repair] Multiplication and division of decimal fractions [cost of repair]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Instructions from customer Interpret equipment diagrams and specifications Interpret repair warranty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classifications, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

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(TASK STATEMENT) REPAIR AUDIO AMPLIFIER

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list Radio-TV standard bench: work bench multimeter signal generator, audio frequency oscilloscope battery eliminator signal tracer vacuum cleaner tube tester transistor tester capacitor checkers resistor substitution box capacitor substitution box	Selecting appropriate technical data Visually inspect and correct obvious defects Performance test and troubleshoot Analyze test results Identify faulty component(s) Remove and replace faulty component(s) Correct frequency response defects (tone control) Diagnose input amplifier circuit Repair microphone	Hazard-personal: Hazardous voltages - electrical shock Heat burns - soldering iron and components Hazard-equipment: Transistor damage when removing or replacing Transformer damage when load is removed Safety-personal: Avoid direct contact with voltage sources Avoid physical contact with heat sources Safety-equipment: Dissipate heat from solid-state devices when soldering Maintain load on output

DECISIONS	CUES	ERRORS
Select replacement parts Determine proper operation	No output Low volume Distortion Motor boating Noise Playback, no record Record, no playback No playback, no record Improper frequency response	Action fails to correct mechanism Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR AUDIO AMPLIFIER

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on state of matter [solid state devices] Resistance of materials to flow of electrical [principles of transistor amplifiers, principles of ohms law, principles of electric power, principles of vacuum tube amplifiers, vacuum tube characteristics, solid-state device characteristics, principles of interaction of circuity] Magnetic fields of force [induction] Impedance matching	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition and subtraction of decimal fractions [cost of repairs] Multiplication and division of decimal fractions [cost of repairs]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Writing Speaking	Instructions from customer Interpret equipment diagram and specifications Interpret repair warranty List of parts and services for billing Explain repair warranty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions Classification, description Terminology, enunciation, clarity of expression, logic

(TASK STATEMENT) REPAIR BIAS OSCILLATOR

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench multimeter signal generator, audio frequency oscilloscope battery eliminator signal tracer vacuum cleaner tube tester transistor tester capacitor checkers resistor substitution box capacitor substitution box	Select appropriate technical data Performance test record and erase section Analyze test results Identify faulty component(s) Remove and replace faulty component(s) Clean tape head	Hazard-personal: Hazardous voltage - electrical shock Heat burns - soldering iron and components Hazard-equipment: Transistor damage when removing or replacing Transformer damage when load is removed Safety-personal: Avoid direct contact with voltage sources Avoid physical contact with heat sources Safety-equipment: Dissipate heat from solid-state devices when soldering Maintain load on output
DECISIONS	**CUES**	**ERRORS**
Select replacement parts Determine proper operation	Will not record Will not erase Distortion in recording No output Low volume Distortion Motor boating Noise Playback, no record Record, no playback No playback, no record Improper frequency response	Action fails to correct mechanism Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR BIAS OSCILLATOR

SCIENCE	MATH – NUMBER SYSTEMS
Effects of heating and cooling on state of matter [solid state devices] **Resistance of materials to flow of electrical current** [principles of transistor amplifiers, principles of ohms law, principles of electric power, principles of vacuum tube amplifiers, vacuum tube characteristics, solid-state devices characteristics, principles of interaction of circuitry] Magnetic fields of force [induction] Principles of oscillators	**Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales]** Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition and subtraction of decimal fractions [cost of repairs] Multiplication and division of decimals fractions [cost of repairs]

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COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Instructions from customer Interpret equipment diagram and specifications **Interpret repair warranty**	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

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Duty C Repairing AM Radios

1 Make preliminary repair estimate (amplitude modulation receiver)
2 Repair detector stage
3 Repair and align IF amplifier section
4 Repair and align converter-mixer stage
5 Repair and align R.F. amplifier

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(TASK STATEMENT) MAKE PRELIMINARY REPAIR ESTIMATE (AMPLITUDE MODULATION RECEIVER)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1)	Verify customer complaint Analyze performance through observation and manipulation of controls Compute estimated cost of repairs	Hazard Electrical shock - electrical burn Possible heat burns Safety Avoid direct contact with any voltage source Avoid direct contact with hot components

DECISIONS	CUES	ERRORS
Estimate cost of parts and labor	No output Distorted output Improper tracking Smoke Noise	Large discrepancy between estimate and actual cost

(TASK STATEMENT) MAKE PRELIMINARY REPAIR ESTIMATE (AMPLITUDE MODULATION RECEIVER)

SCIENCE	MATH – NUMBER SYSTEMS
Principles of vacuum tubes Principles of transistors Power supply electronics Principles of A.M. radio receivers	Addition and subtraction of decimal fractions [cost of estimate] Multiplication and division of decimal fractions [cost of estimate] Finding a percent of a number and what percent one number is of another [profit make-up] Given an instrument of measure determine precision and/or accuracy with respect to manufacturer's specifications [radio dial]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Writing Speaking	Information from customer Interpret repair warranty Estimated cost of repairs Recommend alternative to repairs	Comprehension, information report, description of mechanism Classification, description, terminology Terminology, enunciation, persuasion and sales technique, logic, poise, usage

(TASK STATEMENT) REPAIR DETECTOR STAGE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: workbench VTVM, vacuum tube voltmeter multimeter signal generator, audio frequency signal generator, radio frequency oscilloscope isolation transformer battery eliminator signal tracer vacuum cleaner tube tester transistor tester capacitor checkers resistor substitution box capacitor substitution box	Select appropriate technical data Visually inspect and correct obvious defects Performance test and troubleshoot Analyze test results Identify faulty components Replace faulty components	Hazard-personal Hazardous voltages - electrical shock Heat burns - soldering iron and components Hazard-equipment Transistor damage when removing or replacing Transformer damage when load is removed Safety-personal Avoid direct contact with voltage source Avoid physical contact with heat source Safety-equipment Dissipate heat from solid-state devices when soldering Maintain load on output

DECISIONS	CUES	ERRORS
Select replacement parts Determine proper operation	No output Distorted output No automatic volume control (avc) Squeeling Motorboating	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR DETECTOR STAGE

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on state of matter [solid-state devices] Resistance of materials to flow of electrical current [principles of transistor amplifiers, principles of ohms law, principles of electric power, principles of vacuum tube amplifiers, vacuum tube characteristics, solid-state device characteristics, principles of interaction circuitry] Magnetic fields of force [induction] Principles of radio receivers Principles of rectification Principles of filtering	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition and subtraction of decimal fractions [cost of repairs] Multiplication and division of decimal fractions [cost of repairs]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Instructions from customer Interpret equipment diagram and specifications Interpret repair warranty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classifications, description
Speaking	Explain repair Warranty	Terminology, enunciation, clarity of expression, logic

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(TASK STATEMENT)REPAIR AND ALIGN IF AMPLIFIER SECTION

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter multimeter signal generator, audio frequency signal generator, radio frequency signal tracer oscilloscope isolation transformer battery eliminator vacuum cleaner tube tester transistor tester capacitor checkers sweep signal generator with markers resistor substitution box capacitor substitution box	Select appropriate technical data Visually inspect and correct obvious defects Performance test and troubleshoot by alignment procedure Analyze test results Identify faulty components Remove and replace faulty components Perform complete alignment	Hazard-personal Hazardous voltages - electrical shock Heat burns - soldering iron and components Hazard-equipment Transistor damage when removing or replacing Transformer damage when load is removed Safety-personal Avoid direct contact with voltage source Avoid physical contact with heat sources Safety-equipment Dissipate heat form solid-state devices when soldering Maintain load on output
DECISIONS	**CUES**	**ERRORS**
Select replacement parts Determine proper operation	No output Low volume Distortion Oscillation Noise Chirping Low sensitivity	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

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(TASK STATEMENT) REPAIR AND ALIGN IF AMPLIFIER SECTION

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on state of matter [solid-state devices] Resistance of materials to flow of electrical current [principles of transistor amplifiers, principles of ohms law, principles of electric power, principles of vacuum tube amplifiers, vacuum tube characteristics, solid-state devices characteristics, principles of interaction of circuitry] Magnetic fields of force [induction] Principles of resonance Principles of radio receivers Principles of interstage coupling	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition and subtraction of decimal fractions [cost of repairs] Multiplication and division of decimals fractions [cost of repairs

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Writing Speaking	Instructions from customer Interpret equipment diagrams and specifications Interpret repair warranty List of parts and services for billing Explain repair warranty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions Classifications, description Terminology, enunciation, clarity of expression, logic

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(TASK STATEMENT) REPAIR AND ALIGN CONVERTER-MIXER STAGE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter multimeter signal generator, radio frequency oscilloscope isolation transformer battery eliminator signal tracer vacuum cleaner tube tester transistor tester capacitor checkers resistor substitution box capacitor substitution box	Selecting appropriate technical data Visually inspect and correct defects Performance test and troubleshoot by alignment procedures Analize test results Identify faulty component Remove and replace faulty component Perform complete alignment	Hazard-personal: Hazardous voltage - electrical shock Heat burns - soldering iron and components Hazard-equipment: Transistor damage when removing or replacing Transformer damage when load is removed Safety-personal: Avoid direct contact with voltage sources Avoid physical contact with heat sources Safety-equipment: Dissipate heat from solid-state devices when soldering Maintain load on output
DECISIONS	**CUES**	**ERRORS**
Select replacement parts Determine proper operation	No output Improper tracking Distortion Noise Scratching when tuning Selectivity Low sensitivity	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR AND ALIGN CONVERTER-MIXER STAGE

SCIENCE	MATH – NUMBER SYSTEMS
Effects of heating and cooling on state of matter [solid-state devices] Resistance of materials to flow of electrical current [principles of transistor amplifiers, principles of ohms law, principles of electric power, principles of vacuum tube amplifiers, vacuum tube characteristics, solid-state devices characteristics, principles of interaction of circuitry] Magnetic fields of force [induction] Principle of radio receivers Principles of AM radio transmission Principles of resonance Principles of oscillators Principles of capacitance	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition and subtraction of decimal fractions [cost of repairs] Multiplication and division of decimals fractions [cost of repairs]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Instructions from customer Interpret equipment diagrams and specifications Interpret repair warranty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

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(TASK STATEMENT) REPAIR AND ALIGN R.F. AMPLIFIER

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter multimeter signal generator, radio frequency oscilloscope isolation transformer battery eliminator signal tracer vacuum cleaner tube tester transistor tester capacitor checkers resistor substitution box capacitor substitution box	Select appropriate technical data Visually inspect and correct defects Begin troubleshooting alignment Performance test and troubleshoot Analyze test results Identify faulty component Remove and replace faulty components Perform complete alignment Clean and adjust tuning capacitor	Hazard-personal: Hazardous voltage - electrical shock Heat burns - soldering iron and components Hazard-equipment: Transistor damage when removing or replacing Transformer damage when load is removed Damage to delicate coil wires Safety-personal: Avoid direct contact with voltage source Avoid physical contact with heat source Safety-equipment: Dissipate heat from sold-state devices when soldering Maintain load on output Avoid excessive bending or twisting

DECISIONS	CUES	ERRORS
Select replacement parts Determine proper operation	No output Improper tracking Noise Scratching when tuning Oscillation Distortion Low sensitivity	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR AND ALIGN R.F. AMPLIFIER

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on state of matter [solid-state devices] Resistance of materials to flow of electrical current [principles of transistor amplifiers, principles of ohms law, principles of electric power, principles of vacuum tube amplifiers, vacuum tube characteristics, solid-state devices characteristics, principles of interaction of circuitry] Magnetic fields of force [induction, antenna] Principles of radio receiver Principles of AM radio transmission Principle of resonance Principles of capacitance	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition and subtraction of decimal fractions [cost of repairs] Multiplication and division of decimals fractions [cost of repairs

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Instructions from customer Interpret equipment diagrams and specifications	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	Interpret repair warranty List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

Duty D Repairing FM Radios

1 Make preliminary repair estimate (frequency modulation receiver)
2 Repair and align limiter-discriminator stage
3 Repair and align stereo matrix stage
4 Repair and align IF stage
5 Repair and align converter-mixer stage
6 Repair and align RF amplifier

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(TASK STATEMENT) MAKE PRELIMINARY REPAIR ESTIMATE (FREQUENCY MODULATION RECEIVER)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1)	Verify customer complaint Inspect electrical operation Compute estimated cost of repair	Hazard: Electrical shock-electrical burn Possible heat burns Safety: Avoid direct contact with any voltage source Avoid direct contact with hot component

DECISIONS	CUES	ERRORS
Estimate cost of parts and labor	No output Distorted output Improper tracking Smoke Noise No stereo light No stereo matrix No output-one channel	Large discrepancy between estimate and actual cost

(TASK STATEMENT) MAKE PRELIMINARY REPAIR ESTIMATE (FREQUENCY MODULATION RECEIVER)

SCIENCE	MATH – NUMBER SYSTEMS
Principles of vacuum tubes Principles of transistors Principles of FM radio receivers Principles of multiplexing	Addition and subtraction of decimal fractions [cost estimate] Multiplication and division of decimal fractions [cost estimate] Finding a percent of a number and what percent one number is of another [profit mark-up] Given an instrument of measure, determine precision and/or accuracy with respect ot manufacturer's specifications [test instrument scales]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Writing Speaking	Information from customer Interpret repair warranty Estimated cost of repairs Recommend alternative to repairs Explain repair warranty	Comprehension, informational report, desciption of mechanism Classification, description, terminology Terminology, enunciation, persuasion and sales technique, logic, poise, usage

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(TASK STATEMENT) REPAIR AND ALIGN LIMITER – DISCRIMINATOR STAGE

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TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter multimeter signal generator, audio frequency signal generator, radio frequency oscilloscope isolation transformer battery eliminator UHF-VHF TV antenna signal tracer vacuum cleaner tube tester transistor tester capacitor checkers resistor substitution box capacitor substitution box	Select appropriate technical data Visually inspect and correct obvious defects Performance test and troubleshoot Analyze test results Identify faulty component(s) Remove and replace faulty components Align frequency response curve of resonant circuits	Hazard-personal: Hazardous voltage - electrical shock Heat burns - soldering iron and components Hazardous-equipment: Transistor damage when removing or replacing Transformer damage when load is removed Safety-personal: Avoid direct contact with voltage sources Avoid physical contact with heat sources Safety-equipment: Dissipate heat from solid-state devices when soldering Maintain load on output

DECISIONS	CUES	ERRORS
Select replacement parts Determine proper operation	No output from stage Noise Distortion No automatic frequency control (AFC)	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR AND ALIGN LIMITER - DISCRIMINATOR STAGE

SCIENCE	MATH - NUMBER SYSTEMS
Effects of heating and cooling on state of matter [solid-state devices] Resistance of materials to flow of electrical current [principles of transistor amplifiers, principles of ohms law, principles of electric power, principles of vacuum tube amplifiers, vacuum tube characteristics, solid-state devices characteristics, principles of interaction of circuitry] Magnetic fields of force [induction] Principles of frequency resonance Principle of filtering Principles of rectifiers Principles of radio receivers Principles of noise limiting Demodulation methods	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales] Given a coding system, recognize and identify eacy unit involved by assigning necessary symbols, numerical or literal[resistor/capacitor] Addition and subtraction of decimal fractions [cost of repairs] Multiplication and division of decimals fractions [cost of repairs]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Instructions from customer Interpret equipment diagrams and specifications Interpret repair warranty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

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(TASK STATEMENT) REPAIR AND ALIGN STEREO MATRIX STAGE

45

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter multimeter signal generator, audio frequency signal generator, radio frequency oscilloscope isolation transformer battery eliminator vacuum cleaner tube tester capacitor checkers resistor substitution box capacitor substitution box transistor tester	Select appropriate technical data Visually inspect and correct obvious defects Performance test and troubleshoot Analyze test result Identify faulty component(s) Remove and replace faulty component(s) Align oscillator output Correct band pass filter defects	Hazard-equipment: Transistor damage when removing or replacing Transformer damage when load is removed Hazard-personal: Hazardous voltage - electrical shock Heat burns - soldering from and components Safety-personal: Avoid direct contact with voltage sources Avoid physical contact with heat sources Safety-equipment Dissipate heat from solid-state devices when soldering Maintain load on output
DECISIONS Select replacement parts Determine proper operation	**CUES** No channel separation No stereo indication Steady audio tone heard during stereo reception	**ERRORS** Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

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(TASK STATEMENT) REPAIR AND ALIGN STERO MATRIX STAGE

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on state of matter [solid-state devices] Resistance of materials to flow of electrical current [principles of transistor amplifiers, principles of ohms law, principles of electric power, principles of vacuum tube amplifiers, vacuum tube characteristics, solid-state devices characteristics, principles of interation of circuitry] Magnetic fields of force [induction] Principles of oscillators Principles of filtering Principles of rectifiers Principles of amplitude modulation Principles of multiplexing	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition and subtraction of decimal fractions [cost of repairs] Multiplication and division of decimals fractions [cost of repairs]

A6

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Instructions from customer Interpret equipment diagrams and specifications Interpret repair warranty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

A6

(TASK STATEMENT) REPAIR AND ALIGN IF STAGE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter multimeter signal generator, radio frequency oscilloscope isolation transformer battery eliminator signal tracer vacuum cleaner tube tester transistor tester capacitor checkers sweep signal generator with markers resistor substitution box capacitor substitution box	Select appropriate technical data Visually inspect and correct obvious defects Performance test and troubleshoot by alignment procedure Analyze test results Identify faulty components Remove and replace faulty components Perform complete alignment	Hazard-personal: Hazardous voltage - electrical shock Heat burns - soldering iron and components Hazard-equipment: Transistor damage when removing or replacing Transformer damage when load is removed Safety-personal: Avoid direct contact with voltage sources Avoid physical contact with heat sources Safety-equipment: Dissipate heat from solid-state devices when soldering Maintain load on output

DECISIONS	CUES	ERRORS
Select replacement parts Determine proper operation	No output Low volume Distortion Oscillation Noise Chirping Low sensitivity	Action fails to correct malfunction Excessive labor cost for troubleshooting Accidental damage to good components Unnecessary replacement of good components

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(TASK STATEMENT) REPAIR AND ALIGN IF STAGE

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on state of matter [solid-state devices] Resistance of materials to flow of electrical current [principles of transistor amplifiers, principles of ohms law, principles of electric power, principles of vacuum tube amplifiers, vacuum tube characteristics, solid-state devices characteristics, principles of interaction of circuitry] Magnetic fields of force [induction] Principles of transformers Principles of resonance Principles of radio receivers	**Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales]** Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition and subtraction of decimal fractions [cost of repairs] Multiplication and division of decimals fractions [cost of repairs]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading ✓	Instructions from customer Interpret equipment diagrams and specifications	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	**Interpret repair warranty** List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

(TASK STATEMENT) REPAIR AND ALIGN CONVERTER-MIXER STAGE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV repair work bench: work bench VTVM, vacuum tube coltmeter multimeter signal generator, radio frequency oscilloscope isolation transformer battery eliminator signal tracer vacuum cleaner tube tester transistor tester capacitor checkers sweep signal generator with markers resistor substitution box capacitor substitution box	Selecting appropriate technical data Visually inspect and correct defects Performance test and troubleshoot by alignment procedures Analyze test results Identify faulty component Remove and replace faulty component Perform complete alignment	Hazard-personal: Hazardous voltage - electrical shock Heat burns - soldering iron and components Hazard-equipment: Transistor damage when removing or replacing Transformer damage when load is removed Safety-personal: Avoid direct contact with voltage sources Avoid physical contact with Heat sources Safety-equipment: Dissipate heat from solid-state devices when soldering Maintain load on output
DECISIONS	**CUES**	**ERRORS**
Select replacement parts Determine proper operation	No output Improper tracking Distortion Noise Scratching when tuning Selectivity Low sensitivity	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

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(TASK STATEMENT) REPAIR AND ALIGN CONVERTER-MIXER STAGE

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on state of matter [solid-state devices] Resistance of materials to flow of electrical current [principles of transistor amplifiers, principles of ohms law, principles of electric power, principles of vacuum tube amplifiers, vacuum tube characterisitcs, solid-state devices characteristics, principles of interaction of circuitry] Magnetic fields of force [induction] Principles of FM receivers Principles of FM transmission Principles of resonance Principles of heterodyning Radio frequency neutralization	**Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instruments scales]** Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition and subtraction of decimal fractions [cost of repairs] Multiplication and division of decimals fractions [cost of repairs]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Instructions from customer Interpret equipment diagrams and specifications **Interpret repair warranty**	Comprehension, detail/inference, informational report, description of mechanism, definition, terminolgoy, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

(TASK STATEMENT) REPAIR AND ALIGN RF AMPLIFIER

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube coltmeter multimeter signal generator, radio frequency oscilloscope isolation transformer battery eliminator signal tracer vacuum cleaner tube tester transistor tester capacitor checkers resistor substitution box capacitor substitution box	Select appropriate technical data Visually inspect and correct defects **Begin troubleshooting alignment** Performance test and troubleshoot Analyze test results Identify faulty component Remove and replace faulty components Perform complete alignment Clean and adjust tuning capacitor	Hazard-personal: Hazardous voltage electrical shock Heat burns - soldering iron and components Hazard-equipment: Transistor damage when removing or replacing Transformer damage when load is removed Damage to delicate coil wire Safety-personal: Avoid direct contact with voltage sources Avoid physical contact with heat Safety-equipment: Dissipate heat from solid-state devices when soldering Maintain load on output Avoid excessive bending or tension on coil wires

DECISIONS	CUES	ERRORS
Select replacement parts Determine proper operation	No output Improper tracking Noise Scratching when tuning Oscillation Distortion Low sensitivity	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR AND ALIGN RF AMPLIFIER

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on state of matter [solid-state devices] Resistance of materials to flow of electrical current [principles of transistor amplifiers, principles of ohms law, principles of electric power, principles of vacuum tube amplifiers, vacuum tube characteristics, solid-state devices characteristics, principles of interaction of circuitry] Magnetic fields of force [induction, antenna] Principles of radio receiver Principles of AM radio transmission Principles of resonance Principles of capacitance Principles of RF radio transmission	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instruments scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition and subtraction of decimal fractions [cost of repairs] Multiplication and division of decimals fractions [cost of repairs]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Instructions from customer Interpret equipment diagrams and specifications Interpret repair warranty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

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Duty E Servicing Television Sets

1 Make preliminary repair estimate (television service)
2 Repair low voltage power supply
3 Repair sound section
4 Repair video IF section
5 Repair front end section
6 Repair video detector and AGC section
7 Repair video amplifier section
8 Repair SYNC section
9 Repair sweep section
10 Repair high voltage supply section
11 Repair color SYNC
12 Repair chroma section
13 Repair CRT display section
14 Sweep align color television
15 Set-up color TV
16 Install TV

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(TASK STATEMENT) MAKE PRELIMINARY REPAIR ESTIMATE (TELEVISION SERVICE)

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) TV antenna	Connect known good antenna Verify customer complaint Analyze performance through observation and manipulation of controls Make preliminary cost estimate	Hazard: Electrical shock-electrical burn Possible heat burns Possible implosion of CRT Safety: Avoid direct contact with any voltage source Avoid direct contact with any vacuum tube Protect picture tube during transportation Equipment hazard: Damaging cabinet during transportation
DECISIONS Isolate trouble to defective stage Estimate cost of repairs	**CUES** No output, video/audio Improper video output Improper audio output Controls fail to correct problem Improper color output Arcing, smoke or odor	**ERRORS** Large discrepancy between estimate and actual cost

(TASK STATEMENT) MAKE PRELIMINARY REPAIR ESTIMATE (TELEVISION SERVICE)

SCIENCE	MATH – NUMBER SYSTEMS
TV receiver electronics TV troubleshooting techniques Principles of interaction of circuitry	Addition, subtraction, multiplication and division of decimal fractions [cost estimate] Finding a percent of a number and what percent one number is of another [profit mark-up]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Information from customer Interpret repair warranty	Comprehension, detail/inference, informational report, description of mechanism
Writing	Estimated cost of repairs	Classification, description, terminology, logic
Speaking	Explanation of problem to customer Recommendation of possible alternatives	Terminology, enunciation, clarity of expression, persuasion and sales technique, logic, poise, usage

(TASK STATEMENT) REPAIR LOW VOLTAGE POWER SUPPLY

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench multimeter oscilloscope isolation transformer UHF-VHF TV antenna vacuum cleaner tube tester transistor testor capacitor checker capacitor substitution box	Select appropriate technical data Remove chassis from cabinet Visually inspect and correct obvious defects Performance test and troubleshoot Identify faulty component(s) Remove and replace faulty component(s)	Hazard: Damage to protruding components Electrical shock/burn Possible picture tube implosion Safety: Avoid direct contact with any voltage source Exercise extreme caution when working near high voltage or picture tube connections Protect CRT from striking or scratching Test for chassis leakage current

DECISIONS	CUES	ERRORS
Trouble isolate to stage for repair Select replacement parts Determine proper operation	No sound-no raster Hum in sound or picture Raster too small, picture/sound OK Set requires excessive warm-up time	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR LOW VOLTAGE POWER SUPPLY

SCIENCE	MATH – NUMBER SYSTEMS
Principles of ohms law Principles of power Characteristics of diodes Principles of filtering Half wave rectification Full wave rectification Bridge rectification Resistance of materials to flow of electrical current Effects of temperature on resistance (thermistor) Principles of interaction of circuitry	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instruments scales] Given a coding system, recognize and identify each unit involved by assinging necessary symbols, numerical or literal [resistor/capacitor] Addition, subtraction, multiplication, division of decimal fraction [cost of repair]

LS

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams Interpret repair warranty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

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(TASK STATEMENT) REPAIR SOUND SECTION

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter multimeter signal generator, audio frequency oscilloscope isolation transformer vacuum cleaner tube tester transistor tester capacitor checkers sweep signal generator with markers	Select appropriate technical data Remove chassis from cabinet Visually inspect section and correct obvious defects Performance test and troubleshoot **Identify faulty component (s)** Analyze and align sound I.F. Check and adjust quadrature detector	Hazard: Damage to protruding components Electrical shock/burn Possible picture tube implosion Safety: Avoid direct contact with any voltage source Exercise extreme caution when working near high voltage or picture tube connections Protect CRT from striking or scratching Test for chassis leakage current

DECISIONS	CUES	ERRORS
Isolate trouble in stage for repair Select replacement parts Determine proper operation	**No sound** **Weak or noisy sound** **Distorted sound** **Hum or Buzz in sound**	**Action fails to correct malfunction** **Excessive labor cost for trouble-shooting** **Accidental damage to good components** **Unnecessary replacement of good components**

(TASK STATEMENT) REPAIR SOUND SECTION

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on state of matter [solid-state devices] Resistance of materials to flow of electrical current [principles of transistor amplifiers, principles of ohms law, principles of electric power, principles of vacuum tube amplifiers, vacuum tube characteristics, solid-state devices characteristics, principles of interaction of circuitry] Magnetic fields of force [induction] Principles of frequency resonance Principles of filtering Principles of rectifiers Principles of radio receivers Principles of noise limiting Demodulation methods Principles of interaction of circuitry	**Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instruments scales]** Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition, subtraction, multiplication, and division of decimal fraction[cost of repair]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams **Interpret repair warrenty**	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

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(TASK STATEMENT) REPAIR VIDEO IF SECTION

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter multimeter oscilloscope isolation transformer UHF-VHF TV antenna vacuum cleaner tube tester transistor tester capacitor checkers sweep signal generator with markers TV tuner substitute Low impedance bias box Demodulation probe	Select appropriate technical data Remove chassis from cabinet Visually inspect section and correct obvious defects Performance test and troubleshoot Identify faulty component(s) Analyze and align video IF section CAUTION: Strict observance of technical reference test procedures are necessary when aligning IF	Hazard: Damage to protruding components Electrical shock/burn Possible picture tube implosion Safety: Avoid direct contact with any voltage source Exercise extreme caution when working near high voltage or picture tube connections Protect CRT from striking or scratching Test for chassis leakage current

DECISIONS	CUES	ERRORS
Isolate trouble in stage for repair Select replacement parts Determine proper operation (sensitivity test)	Ringing or multiple ghosts Loss of detail or smearing No picture, no color, no sound-raster OK Snowy picture, poor or no color, weak sound-raster OK Negative picture phase No snow between channels	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR VIDEO IF SECTION

SCIENCE	MATH – NUMBER SYSTEMS
Principles of transistor amplifiers Principles of vacuum tube amplifiers Principles of resonance Coupling configurations Principles of FM radio receivers Principles of TV receivers Analysis of complex wave forms Principles of interaction of circuitry	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instruments scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition, subtraction, multiplication, division of decimal fractions [cost of repair]

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COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams Interpret repair warrenty	Comprehension, detail/inference informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

C1

(TASK STATEMENT) REPAIR FRONT END SECTION

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench work bench VTVM, vacuum tube voltmeter multimeter oscilloscope isolation transformer UHF-VHF TV antenna vacuum cleaner tube tester transistor tester capacitor checkers sweep signal generator with marker (UHF-VHF) TV tuner substitute Low impedance bias box Contact cleaner spray	Select appropriate technical data Remove chassis from cabinet Visually inspect section and correct obvious defects Performance test and troubleshoot Identify faulty components Remove and replace faulty components Clean and make minor adjustments to tuner Remove tuner for shipment to specialized repair facility Replace tuner	Hazard: Damage to protruding components Electrical shock/burn Possible picture tube implosion Safety: Avoid direct contact with any voltage source Exercise extreme caution when working near high voltage or picture tube connections Protect CRT from striking or scratching Test for chasis leakage current

DECISIONS	CUES	ERRORS
Isolate trouble to stage for repair Select replacement parts Determine proper operation	No picture, no sound: raster OK Snowy picture, sound weak or OK: raster OK Hum in picture accompanied by bending of vertical lines Loss of picture detail: sound OK: raster OK Smearing of large objects: sound OK/ raster OK Receiver can tune one or several channels in a locality, but not others Station drift Cross modulation	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR FRONT END SECTION

SCIENCE	MATH – NUMBER SYSTEMS
Principles of transistor amplifiers Principles of vacuum tube amplifiers Principles of resonance Coupling configurations Principles of FM radio receivers Principles of TV receivers Analysis of complex wave forms Principles of interaction of circuitry	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instruments scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition, subtraction, multiplication, division of decimal fraction [cost of repair]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams Interpret repair warrenty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

(TASK STATEMENT) REPAIR VIDEO DETECTOR AND AGC SECTION

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TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter multimeter oscilloscope isolation transformer UHF-VHF TV antenna Vacuum cleaner Tube tester Transistor tester Capacitor checkers Sweep signal generator with markers TV signal substituter Low - impedance bias box Low capacity probe Demodulator probe	Select appropriate technical data Remove chassis from cabinet Visually inspect section and correct obvious defects Perform test and troubleshoot Identify faulty component(s) Replace faulty component(s) Make video detector and AGC adjustments	Hazard: Damage to protruding components Electrical shock/burn Possible picture tube implosion Safety: Avoid direct contact with any voltage source Exercise extreme caution when working near high voltage or picture tube connections Protect CRT from striking or scratching Test for chassis leakage current

DECISIONS	CUES	ERRORS
Isolate trouble in stage for repair Select replacement parts Determine proper operation	No picture/no sound-raster OK Weak picture and/or sound-raster OK Motor boating and fluttering picture Loss of detail, loss of color, and smearing, multiple ghosts/ringing Snow on fairly strong signals Overload evidenced by negative picture unstable sync., excessive contrast or buzz in sound Cross modulation Airplane flutter Unstable sync. under noisy conditions	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR VIDEO DETECTOR AND AGC SECTION

SCIENCE	MATH – NUMBER SYSTEMS
Principles of transistor amplifiers Principles of vacuum tube amplifiers Principles of rectification Control of gain through bias Analysis of complex wave forms Principles of AM detection Principles of resonance Principles of interaction of circuitry	**Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications** [test instruments scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition, subtraction, multiplication, division of decimal fraction [cost of repair]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams Interpret repair warrenty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

(TASK STATEMENT) REPAIR VIDEO AMPLIFIER SECTION

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter multimeter oscilloscope isolation transformer UHF-VHF TV antenna Vacuum cleaner Tube tester Transistor tester Capacitor checkers Sweep signal generator with markers TV signal substituter Low capacitance probe Detector probe	Select appropriate technical data Remove chassis from cabinet Visually inspect section and correct obvious defects Performance test and trouble shoot Identify faulty components(s) Remove and replace faulty component(s)	Hazard: Damage to protruding components Electrical shock/burn Possible picture tube implosion Safety: Avoid direct contact with any voltage source Exercise extreme caution when working near high voltage or picture tube connections Protect CRT from striking or scratching Test for chassis leakage current

DECISIONS	CUES	ERRORS
Isolate trouble in stage for repair Select replacement parts Determine proper operation	No picture, no color-sound and raster OK Poor picture, wrong colors-sound and raster OK Color fringing on color pictures-black and white picture is OK Hum in picture-sound and raster OK Insufficient brightness and/or contrast	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR VIDEO AMPLIFIER SECTION

SCIENCE	MATH – NUMBER SYSTEMS
Principles of transistor amplifiers Principles of vacuum tube amplifiers Analysis of complex wave forms Principles of television receivers Principles of interaction of circuitry	Locate by approximation rational numbers and integers on the number line (sequential ordeing) [test instrument scales] Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instruments scales] Addition, subtraction, multiplication, division of decimal fraction [cost of repair]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	Interpret repair warrenty List of parts and services for billing	Classifications, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

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(TASK STATEMENT) REPAIR SYNC SECTION

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter oscilloscope isolation transformer vacuum cleaner transistor tester capacitor checkers Low capacitance probe Low impedance bias box	Select appropriate technical data Remove chassis from cabinet Visually inspect section and correct obvious defects Performance test and troubleshoot Identify faulty component(s) Remove and replace faulty conponent(s)	Hazard: Damage to protruding components Electrical shock/burn Possible picture tube implosion Safety: Avoid direct contact with any voltage source Exercise extreme caution when working near high voltage or picture tube connections Protect CRT from striking or scratching Test for chassis leakage current

DECISIONS	CUES	ERRORS
Isolate trouble in stage for repair Select replacement parts Determine proper operation	Picture information scrambled, streaks and color splotches Picture rolling vertically but holds horizontally Picture jitters vertically Picture appears shaky horizontally Section of picture is torn out Picture does not interlace properly Picture bending at top and flag waving	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR SYNC SECTION

SCIENCE	MATH – NUMBER SYSTEMS
Principles of transistor amplifiers Principles of vacuum tube amplifiers Principles of interaction of circuitry Principles of television receivers	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales] Given coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition, subtraction, multiplication, division of decimal fraction [cost of repair]

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COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams Interpret repair warrenty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions Classification, description
Writing Speaking	List of parts and services for billing Explain repair warranty	Terminology, enunciation, clarity of expression, logic

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(TASK STATEMENT) REPAIR SWEEP SECTION

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter multimeter oscilloscope isolation transformer vacuum cleaner tube tester transistor tester capacitor checkers TV signal substituter resistor substitution box capacitor substitution box color TV test jig	Select appropriate technical data Remove chassis from cabinet Visually inspect section and correct obvious defects Performance test and troubleshoot Identify faulty component(s) Replace faulty component(s) Make adjustments (size and linearity) with customer controls at mid-range Check and adjust high voltage and horizontal efficiency	Hazard: Damage to protruding components Electrical shock/burn Possible picture tube implosion Safety: Avoid direct contact with any voltage source Exercise extreme caution when working near high voltage or picture tube connections Protect CRT from striking or scratching Test for chassis leakage current Equipment Hazard: Do not remove horizontal oscillator tube with power on Deflection yoke replacement should not be accomplished without first "flagging" all connections and making a drawing
DECISIONS Isolate trouble in stage for repair Select replacement parts Determine proper operation	**CUES** Bright horizontal line, no raster and sound is OK Insufficient height or width: sound and picture OK Picture will not hold with controls No raster: sound OK Non-linearity (fold-over, etc.): sound OK Picture shows color fringing at edges Keystone, small picture, tilted picture	**ERRORS** Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR SWEEP SECTION

SCIENCE	MATH – NUMBER SYSTEMS
Principles of transistor amplifiers Principles of vacuum tube amplifiers Principles of resonance Coupling configurations Principles of FM radio receivers Principles of TV receivers Analysis of complex wareforms Principles of interaction of circuitry	Locate by approximation rational numbers and integers on the number line (sequential ordering) [test instrument scales] Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instruments scales] Addition, subtraction, multiplication, division of decimal fraction [cost of repair]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	Interpret repair warrenty List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

(TASK STATEMENT) REPAIR HIGH VOLTAGE SUPPLY SECTION

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter (with high voltage probe) oscilloscope isolation transformer vacuum cleaner tube tester transistor tester capacitor checkers	Select appropriate technical data Remove chassis from cabinet; visually inspect section and correct obvious defects; performance test and trouble-shoot; identify faulty component(s); remove and replace faulty components; make high voltage adjustments Rule of thumb: normal procedure when replacement of a tube or the fly-back transformer in the high voltage section is required, all tubes in this section should be replaced. When removing a flyback transformer, care must be exercised to "flag" all connections and make a simple drawing of physical wire connections. High quality lead dress and solder connections are essential to prevent corona. Do not permit set to run with voltages higher than manufacturer's specifications.	Hazard: Electrical shock/burn Heat burns Safety: Extreme caution is necessary when working in this section; hazardous voltages exist Do not move or touch high-voltage plate caps or connecting leads until receiver is turned off and high voltage capacitors and picture tube have been discharged Insure no evidence of corona or arcing is present after repair

DECISIONS	CUES	ERRORS
Isolate trouble in stage for repair Select replacement parts Determine proper operation Insure high voltage dropout feature is functioning	No raster, sound OK Very dim, enlarged raster and sound is OK Poor focus receiver otherwise OK Changes of size with screen changes Color fringing and sound OK Arcing, corona and the smell of ozone Circuit breaker open	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR HIGH VOLTAGE SUPPLY SECTION

SCIENCE	MATH – NUMBER SYSTEMS
Principles of ohms law Principles of power Principles of transformers Principles of filtering Principles of rectification Principles of voltage doublers Principles of electrostatic charges Magnetic fields of force [electro-magnetic] X-ray radiation - hazards and safeguards Principles of interaction of circuitry	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition, subtraction, multiplication, division of decimal fraction [cost of repair]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams Interpret repair warrenty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

(TASK STATEMENT) REPAIR COLOR SYNC

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter multimeter color bar generator oscilloscope isolation transformer UHF–VHF TV antenna vacuum cleaner tube tester transistor tester capacitor checkers sweep signal generator with markers resistor substitution box capacitor substitution box TV tuner substitute	Select appropriate technical data Remove chassis from cabinet Visually inspect section and correct obvious defects Perform color sync alignment to aid in isolation of trouble Identify faulty component(s) Remove and replace faulty component(s) Perform complete color sync alignment Adjust color-kill control	Hazard: Damage to protruding components Electrical shock/burn Possible picture tube implosion Safety: Avoid direct contact with any voltage source Exercise extreme caution when working near high voltage or picture tube connections Protect CRT from striking or scratching Test for chassis leakage current

DECISIONS	CUES	ERRORS
Isolate trouble in stage for repair Select replacement parts Determine proper operation	Color splotches or confetti on black and white; color pictures show ''barber pole effect'' Picture good; no color or weak color Green screen	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR COLOR SYNC

SCIENCE	MATH – NUMBER SYSTEMS
Principles of vacuum tube amplifiers Principles of transistor amplifiers Principles of oscillators Analysis of complex waveforms Principles of interaction of circuitry Principles of filtering Magnetic fields of force [induction]	**Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications** [test instrument scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition, subtraction, multiplication, division of decimal fraction [cost of repair]

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COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams **Interpret repair warranty**	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing Speaking	**List parts and services for billing** Explain repair warranty	Classification, description Terminology, enunciation, clarity of expression, logic

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(TASK STATEMENT) REPAIR CHROMA SECTION

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter multimeter color bar generator oscilloscope isolation transformer UHF-VHF TV antenna vacuum cleaner tube tester transistor tester capacitor checkers sweep signal generator with markers resistor substitution box capacitor substitution box	Select appropriate technical data Remove chassis from cabinet Visually inspect section and correct obvious defects Isolate problem to stage by signal tracing Identify faulty component(s) Remove and replace faulty component(s)	Hazard: Damage to protruding components Electrical shock/burn Possible picture tube implosion Safety: Avoid direct contact with any voltage source Exercise extreme caution when working near high voltage or picture tube connections Protect CRT from striking or scratching Test for chassis leakage current

DECISIONS	CUES	ERRORS
Isolate trouble in section Select replacement parts Determine proper operation	No color, black and white picture, sound and raster OK Absence of one color Wrong colors (improper flesh tone) Ringing, color-hum on color reception Predominant color background on color reception	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR CHROMA SECTION

SCIENCE	MATH – NUMBER SYSTEMS
Principles of vacuum tube amplifiers Principles of transistor amplifiers Principles of transformers Analysis of complex waveforms Magnetic fields of force [inductance] Principles of resonance Principles of filtering	**Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications** [test instrument scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition, subtraction, multiplication, division of decimal fraction [cost of repair]

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COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	**Interpret equipment specifications** Technical reference manuals Interpret schematic diagrams **Interpret repair warranty**	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

(TASK STATEMENT) REPAIR CRT DISPLAY SECTION

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench work bench VTVM, vacuum tube voltmeter multimeter isolation transformer oscilloscope UHF-VHF TV antenna vacuum cleaner cathode ray tube tester color TV test jig	Select appropriate technical data Verify proper operation of associated circuitry to isolate problem to CRT display Visually inspect for obvious defects (cracked tube, filaments not lit, burnt tube socket, etc.) Test CRT emission with CRT tester and attempt rejuvenation if indicated possible Remove and replace CRT Perform color set-up procedures	Hazard: Damage to protruding components Electrical shock/burn Possible picture tube implosion Safety: Avoid direct contact with any voltage source Exercise extreme caution when working near high voltage or picture tube connections Protect CRT from striking or scratching Test for chassis leakage current Exercise extreme care when removing or replacing picture tube (CRT); jarring excessive pressure, bumping or dropping could cause violent implosion of the envelop; DO NOT HANDLE TUBE BY NECK-WEAR SAFETY GOGGLES

DECISIONS	CUES	ERRORS
Isolate problem to stage Select replacement parts Determine proper operation Rule of thumb: A CRT that checks bad should be replaced, however, a CRT that checks good may still be inoperative under stress of the high voltage in the circuit. Rejuvenation of CRT should only be attempted after advising the customer of the success possibilities and informing him/her that it is only temporary even if successful	No raster; sound OK, high voltage output OK One color missing or will not adjust Dim raster, low contrast and low brightness Intermittant loss of video or raster Out of focus picture Raster with wrong color over half of screen Purity changes with warm-up	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR CRT DISPLAY SECTION

SCIENCE	MATH – NUMBER SYSTEMS
Principles of cathode ray tubes and electron guns Principles of interaction of circuitry Analysis of complex waveforms	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition, subtraction, multiplication, division of decimal fraction [cost of repair]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams Interpret repair warranty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

(TASK STATEMENT) SWEEP ALIGN COLOR TELEVISION

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Radio-TV standard bench: work bench VTVM, vacuum tube voltmeter multimeter signal generator, radio frequency color bar generator oscilloscope isolation transformer battery eliminator vacuum cleaner sweep signal generator with markers TV signal substituter resistor substitution box Low impedance bias box Appropriate matching pads and probes dictated by technical alignment data	Select appropriate technical data Performance test and analyze to insure no repair action is obvious; set customer controls to mid-range; disable horizontal, vertical and color oscillators; set tuner to an unused channel and adjust bias; connect signal generator with matching pads to mixer input; observe output of IF with oscilloscope, set traps and align link; connect oscilloscope to output of second IF, align inter-stage; connect scope to second detector, align traps and overall; connect sweep generator to input of first color amplifier, observe wave form at output and adjust band pass; observe waveform at output of second color amplifier and adjust band pass; inject sweep at mixer input, observe output of second color amp and adjust peaking coil	Hazard: Damage to protruding components Electrical shock/burn Possible picture tube implosion Safety: Avoid direct contact with any voltage source Exercise extreme caution when working near high voltage or picture tube connections Protect CRT from striking or scratching Test for chassis leakage current
DECISIONS	**CUES**	**ERRORS**
Select appropriate matching pads Determine proper operation	Deviations detected through precision measurements Rule: strict adherance to manufacturer specifications is necessary to insure successful alignment	Poor quality picture and repair actions fail to correct Accidental damage to good components

(TASK STATEMENT) SWEEP ALIGN COLOR TELEVISION

SCIENCE	MATH – NUMBER SYSTEMS
Principles of vacuum tube amplifiers Principles of transistor amplifiers Principles of transformers Analysis of complex waveforms Magnetic fields of force [induction] Principles of resonance Principles of filtering	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [radio dial] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor/capacitor] Addition, subtraction, multiplication, division of decimal fractions [cost of repair]

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COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications, technical reference manuals Interpret schematic diagrams Interpret repair warranty	Comprehension, detail inference informational report, description of mechanism, definition, terminology, instructions
Writing	List of parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

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(TASK STATEMENT) SET-UP COLOR TV

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Color bar generator VTVM De-gaussing coil	Select appropriate technical data Performance test and analyze to insure no repair action is obvious De-gauss receiver Adjust for proper high voltage, horizonal and vertical centering, AGC focus and horizontal hold Perform color purity, set-up procedures Perform color CRT gray set-up procedures Perform color CRT static convergence set-up procedures Perform color CRT dynamic convergence set-up procedures Move receiver to viewing position and adjust customer controls for flesh tone, brightness and contrast desired Demonstrate use of customer controls to user	Hazard: Electrical shock Safety: Avoid direct contact with any voltage source Equipment Hazard: Movement of receivers required Pick-up and move vertically, do not rotate receivers from wall
DECISIONS	**CUES**	**ERRORS**
Separate set-up requirements from repair action Determine proper operation	Sound, black and white picture and raster OK Incorrect color or color ghosts Customer controls do not give correct hues Colors do not match the image (especially on corners of screen)	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) SET-UP COLOR TV

SCIENCE	MATH – NUMBER SYSTEMS
Principles of electron guns Principles of electro static fields Principles of magnetic control of electron flow Principles of interaction of circuitry	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret repair warranty Interpret manufacturer's specifications	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology
Writing	Bills for services	Classification, description, terminology logic
Speaking	Explanation of service warranty Instruct customer on use of controls	Terminology, clarity of expression, persuasion, logic

(TASK STATEMENT) INSTALL TV

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (see index 1) Color bar generator VTVM De-gaussing coil	Connect receiver at its proper location and allow approximately 10 minutes for warm-up Adjust AGC for location, if required De-gauss receiver Inspect receiver for purity and convergence; perform color set-up, if required Instruct the customer in proper operation of receiver	Hazard: Electrical shock - electrical burn Possible heat burns Possible implosion of CRT Safety: Avoid direct contact with any voltage source Avoid direct contact with any vacuum tube Protect picture tube during transportation Equipment hazard: Damaging cabinet during transportation

DECISIONS	CUES	ERRORS
Determine location of set (near antenna, away from motors, slightly away from wall and pleasing to customer) Determine proper operation	New receivers are fully factory adjusted No adjustments should be required or attempted unless absolutely necessary	Customer relations damaged

(TASK STATEMENT) INSTALL TV

SCIENCE	MATH – NUMBER SYSTEMS
Principles of color set-up Magnetic fields of force [electromagnetic and interference]	

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret repair warranty Interpret manufacturer's specifications	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology
Writing	Bill for services	Classification, description, terminology, logic
Speaking	Explanation of service warranty Instruct customer on use of controls	Terminology, clarity of expression, persuasion, logic

Duty F Installing and Repairing TV Antenna Systems

1 Install antenna systems
2 Repair antenna systems

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(TASK STATEMENT) INSTALL ANTENNA SYSTEMS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list: ladder field strength meter ball peen hammer stall drill electric drill hack saw gin pole (tower only) hardhat wrenches fish line or small chain (for pulling wires) measuring tape keyhole saw safety belt	Analyze site for best location of antenna Assemble and install tower Assemble and install mast Install rotor and rotor control Assemble and install antenna Adjust rotor control for correct antenna direction Adjust antenna orientation for best reception (if no rotor) Connect line from antenna to receiver Install lightning arrestor and ground Verify proper operation of system Demonstrate rotor operation to customer Compute bill for parts and services	Hazard: Punching or drilling into electric wires Shock hazard from house wiring Water damage from punctured water lines Leaking gas from punctured gas lines Physical injury from falling parts or tools Electric shock-electric burns Falling from roof or ladder Safety: Obtain wiring diagrams or photographs to determine location of existing wiring and pipes Avoid punching or drilling around wall studs Wear hard hat and safety goggles Wear safety belt when climbing antenna tower Wear shoes with good traction for climbing on roofs Keep antenna from touching power lines
DECISIONS Select system components Determine proper operation	**CUES** Rotor does not operate Poor or no signal at antenna connection to receiver Rain water enters building at line entrance	**ERRORS** Improper wiring connections Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) INSTALL ANTENNA SYSTEMS

SCIENCE	MATH – NUMBER SYSTEMS
Basic electricity (for terminating rotor control leads and antenna lines) Impedance matching	Basic arithmetic for determining length of antenna line and rotor control wires Addition, subtraction, multiplication and division of decimal fractions [compute bill] Finding a percent of a number and what percent one number is of another [profit mark-up] Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [read field strength meter, read tape measure]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Listening	Information from customer	Auditory discrimination, concentration, logic
Speaking	Advise customer on choice of system, location of antenna and rotor control, operation of system, maintenance and servicing Explain new equipment warranty	Terminology, implying, enunciation, clarity of expression, persuasion, logic, usage
Reading	Interpret manufacturer's technical data	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology

(TASK STATEMENT) REPAIR ANTENNA SYSTEMS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list: ladder field stength meter ball peen hammer stall drill electric drill hack saw gin pole (tower only) hardhat wrenches fish line or small chain (for pulling wires) measuring tape keyhole saw safety belt	Verify customer complaints Select appropriate technical data Visually inspect and correct obvious defects Performance test and troubleshoot Replace antenna line Repair antenna line connections Repair or replace rotor Repair or replace rotor control Repair or replace rotor control line Replacing lightning arrestor and ground connections Repair or replace tower or mast Repair or replace antenna Compute bill for parts and services	Hazard: Physical injury from failing parts or tools Falling from roof or ladder Electrical shock/burn Safety: Wear hardhat and safety goggles Wear safety belt when climbing antenna tower Keep antenna from touching power lines Wear shoes with good traction for climbing

DECISIONS	CUES	ERRORS
Select replacement parts Determine proper operation	Shorted lightning arrestor Poor or no signal at connections to receiver Rotor does not operate Water entering building at line entrance Antenna or tower threatening to fall	Action fails to correct malfunction Excessive labor costs for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR ANTENNA SYSTEMS

SCIENCE	MATH – NUMBER SYSTEMS
Basic electricity (for terminating rotor control leads and antenna lines) Impedance matching	Basic arithmetic for determining length of antenna line and rotor control wires Subtraction, addition, multiplication, and division of decimal fractions [compute bill] Finding a percent of a number and what percent one number is of another [profit mark-up] Given an instrument of measure, determine precision, and/or accuracy with respect to manufacturer's specifications [tape measure]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Listening	Information from customer	Auditory discrimination, concentration, logic
Speaking	Explain repair warranty Recommendations to repair alternatives	Terminology, implying, enunciation, clairty of expression, persuasion, logic, usage
Reading	Interpret manufacturer's technical data Interpret repair warranty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology

Duty G Installing and Repairing Wired Intercommunication Systems

1 Install wired intercom sets
2 Make preliminary repair estimate
3 Repair power supply
4 Repair audio amplifier

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(TASK STATEMENT) INSTALL WIRED INTERCOM SETS

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list: fish line or small chain (for pulling wires) drill and bits (ground drill if electric) keyhole saw measuring tape	Coordinate location of master and remote stations with the customer Cut or punch wall and install interstation lines Install master and remote stations Verify proper operation Demonstrate proper operation to customer Compute bill for parts and installation	Hazard: Punching or drilling into electric wires - shock hazard Water damage from punctured water lines Leaking gas from punctured gas lines Loss of vision from flying particles when drilling or punching Safety: Obtain wiring diagram and photographs to locate existing wiring; Avoid drilling or punching around wall studs Use properly grounded tools to ground current if wiring is struck Obtain diagrams or photographs to locate gas and water lines. Shut off valves if punctured. Call the plumber or gas company Wear safety goggles
DECISIONS	**CUES**	**ERRORS**
Choose master and remote intercom units Determine proper operation	Oscillation or motorboating Electrical shock to user Hum or buzz in speakers Interstation wire connections reversed	Action fails to correct malfunction Excessive labor costs for troubleshooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) INSTALL WIRED INTERCOM SETS

SCIENCE	MATH – NUMBER SYSTEMS
Basic electricity (for terminating intercom wires)	Addition, subtraction, multiplication, and division of whole numbers [for estimating length of interconnecting cables in feet] Addition, subtraction, multiplication, and division of decimal factors [compute bill] Finding a percent of a number and what percent of a number is of another [profit mark-up]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Listening	Information from customer	Auditory discrimination, concentration, logic
Speaking	Advise customer on choice of system, location of master and remote units operation of system, maintenance and service Explain new equipment warranty	Terminology, inplying, enunciation, clairty of expression, persuasion, logic, usage
Reading	Interpret manufacturer's technical data Interpret repair warrenty	Comprehension, detail/inference, informational report, description of mechanism, definition, terminology

(TASK STATEMENT) MAKE PRELIMINARY REPAIR ESTIMATE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (index 1)	Verify complaint Analyze performance through observation and manipulation of controls Open intercom for visual inspection Compute estimated cost of repairs	Hazard: Electrical shock to user-electrical burn Safety: Provide shock isolation of intercom from power source Avoid completing circuit with person until corrected
DECISIONS	**CUES**	**ERRORS**
Estimate cost of repairs and labor	No receive, send OK No send, receive OK No send or receive Weak or distorted sound Send and receive to some remotes Hum in speaker Buzz in speaker Oscillation or motorboating Smoke Electrical shock to user	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) MAKE PRELIMINARY REPAIR ESTIMATE

SCIENCE	MATH – NUMBER SYSTEMS
Principles of vacuum tubes Principles of transistors Power supply electronics Principles of intercom systems	Addition and subtraction of decimal fractions Multiplication and division of decimal fractions [cost estimate] Finding a percent of a number and what percent one number is of another [profit mark-up]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Information from customer Interpret repair warranty Estimated cost of repairs	Comprehension, information report, description of mechanism
Writing		Classification, description, terminology
Speaking	Recommend alternative to repairs Explain repair warranty	Terminology, enunciation, persuasion and sales technique, logic, poise, usage

(TASK STATEMENT) REPAIR POWER SUPPLY

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (index 1) Radio-TV standard bench Work bench VTVM, vacuum tube voltmeter Multimeter Oscilloscope Isolation transformer Battery eliminator Vacuum cleaner Tube tester Capacitor substitution box	Select appropriate technical data Visually inspect and correct obvious defects Performance test and troubleshoot Identify faulty component (s) Remove and replace faulty components	Hazard-personal Electric shock-electric burns Heat burns-hot components Hazard-equipment Damage to solid state devices when soldering Safety-personal Avoid direct contact with voltage sources Avoid physical contact with heat sources Discharge electrolytic capacitors after removing power Safety-equipment Dissipate heat from solid-state devices when soldering

DECISIONS	CUES	ERRORS
Select replacement parts Determine proper operation	Smoke Hissing Hum Blown fuse No voltage output	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR POWER SUPPLY

SCIENCE	MATH – NUMBER SYSTEMS
Principles of ohms law Principles of electric power Solid-state device characteristics Filtering principles Half waver rectification Full wave rectification Bridge rectification Magnetic fields of force (inductance) Resistance of materials to flow of electrical current Principles of interaction of circuitry Effect of heating and cooling on state of matter (Change of matter from one form to another) [solid state devices]	Given an instrument of measure, determine precision, and/or accuracy with respect to manufacturer's specifications (Test instrument scales) Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal (Resistor capacitor) Addition and subtraction of decimal fractions Multiplication and division of decimal fractions (Cost of repairs)

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams Interpret repair warranty	Comprehension, detail/inference, information report, description of mechanism, definition, terminology, instructions
Writing	List parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

(TASK STATEMENT) REPAIR AUDIO AMPLIFIER

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list (index 1) Radio-TV standard bench Work bench Multimeter Signal generator, audio frequency Oscilloscope Battery eliminator Signal tracer Vacuum cleaner Tube tester Transistor tester Capacitor checkers Resistor substitution box Capacitor substitution box	Select appropriate technical data Visually inspect and correct obvious defects Performance test and troubleshoot Analyze test results Identify faulty components	Hazard-personal Hazardous voltages-electrical shock Heat burns-hot components Hazard-equipment Damage to solid-state devices when soldering Transformer damage when load is removed Safety-personal Avoid direct contact with voltage sources Avoid physical contact with heat sources Safety-equipment Dissipate heat from solid-state devices when soldering Maintain load on output
DECISIONS	**CUES**	**ERRORS**
Select replacement parts Determine proper operation	No output Low volume Distortion Motorboating Noise	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR AUDIO AMPLIFIER

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on state of matter (Change of dimensions) [solid-state devices] Resistance of materials to flow of electrical current Principles of transistor amplifiers Principles of ohms law Principles of electric power Principles of vacuum tube amplifiers Vacuum tube characteristics Solid-state device characteristics Principles of interaction of circuitry	Given an instrument of measure, determine precision, and/or accuracy with respect to manufacturer's specifications (test instrument scales) Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal (resistor capacitor) Addition and subtraction of decimal fractions Multiplication and division of decimal fractions (cost of repairs)

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams Interpret repair warranty	Comprehension, detail/inference, information report, description of mechanism, definition, terminology, instructions
Writing	List parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

Duty H Repairing Wireless Intercommunication Sets

1 Make preliminary repair estimate
2 Repair power supply
3 Repair audio output amplifier-modulator
4 Repair R.F. amplifier-oscillator
5 Repair detector circuit
6 Repair squelch circuit

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(TASK STATEMENT) MAKE PRELIMINARY REPAIR ESTIMATE

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list	Verify complaint Analyze performance through observation and manipulation of controls Compute estimated cost of repairs	Hazard Electrical shock-electric burns Heat burns-hot components Safety Avoid direct contact with voltage sources Avoid contact with heat sources

DECISIONS	CUES	ERRORS
Determine estimate of cost of repairs and labor	No receive, send OK No send, receive OK No send and receive Hum in speaker Buzz in speaker Motorboating or oscillation Smoke Electrical shock to user	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) MAKE PRELIMINARY REPAIR ESTIMATE

SCIENCE	MATH – NUMBER SYSTEMS
Principles of intercom operation Principles of AM radio receivers Principles of AM transmitters Principles of vacuum tubes Principles of transistors	Addition and subtraction of decimal fractions Multiplication and division of decimal fractions (cost estimate) Finding a percent of a number and what percent one number is of another (profit mark-up)

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading Writing Speaking	Information from customer Interpret repair warranty Estimated cost of repairs Recommend alternative to repairs Explain repair warranty	Comprehension, information report, description of mechanism Classification, description, terminology Terminology, enunciation, persuasion and sales technique, logic, poise, usage

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(TASK STATEMENT) REPAIR POWER SUPPLY

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list Radio-TV standard bench: Work bench VTVM, vacuum tube voltmeter Multimeter Oscilloscope Isolation transformer Battery eliminator Vacuum cleaner Tube tester Transistor tester Resistor substitution box Capacitor substitution box	Select appropriate technical data Visually inspect and correct obvious defects Performance test and troubleshoot Identify faulty components Remove and replace faulty components	Hazard-Personal Electric shock-[illegible]tric burns Heat burns-h[illegible]mponents Hazard-Equip[illegible] Damage [illegible]olid-state devices when soldering Safety-Personal Avoid direct contact with voltage sources Avoid physical contact with heat sources Discharge electrolytic capacitors after removing power Safety-Equipment Dissipate heat from solid-state devices when soldering
DECISIONS	**CUES**	**ERRORS**
Select replacement parts Determine proper operation Select correct interconnecting line wire size	Smoke Hissing Hum Blown fuse No voltage output	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR POWER SUPPLY

SCIENCE	MATH – NUMBER SYSTEMS
Principles of ohms law Principles of electric power Vacuum tube characteristics Solid-state device characteristics Filtering principles Half-wave rectification Full-wave rectification Bridge rectification Magnetic fields of force (inductance) Resistance of materials to flow of electrical current Principles of interaction of circuitry Effect of heating and cooling on state of matter (Change of matter from one form to another) [Solid-state devices]	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor, capacitor] Addition and subtraction of decimal fractions Multiplication and division of decimal fractions [cost of repairs]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams Interpret repair warranty	Comprehension, detail/inference, information report, description of mechanism, definition, terminology, instructions
Writing	List parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

(TASK STATEMENT) REPAIR AUDIO OUTPUT AMPLIFIER-MODULATOR

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list Radio-TV standard bench: Work bench VTVM, vacuum tube voltmeter Multimeter Signal generator, audio frequency Oscilloscope Isolation transformer Battery eliminator Signal tracer Vacuum cleaner Tube tester Transistor tester Capacitor checkers Resistor substitution box Capacitor substitution box Signal generator, radio frequency	Select appropriate technical data Visually inspect and correct obvious defects Performance test and troubleshoot Identify faulty component (s) Remove and replace faulty components	Hazard-Personal Hazardous burns-electrical shock Heat burns-hot components Safety-Personal Avoid direct contact with voltage sources Avoid physical contact with heat sources Hazard-Equipment Damage to solid-state devices when soldering Transform damage when load is removed Safety-Equipment Dissipate heat from solid state devices when soldering Maintain load on output
DECISIONS	**CUES**	**ERRORS**
Select replacement parts Determine proper operation	No send, receive OK No receive, send OK No send, no receive No alert or call tone Distortion send, receive OK Distorted send and receive Hum Buzz Low sensitivity Oscillation	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR AUDIO OUTPUT AMPLIFIER-MODULATOR

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on state of matter (Change of matter from one form to another) [solid state devices] Resistance of materials to flow of electrical current Principles of transistor amplifiers Principles of ohms law Principles of electric power Principles of vacuum tube amplifiers Solid-state device characteristics Vacuum tube characteristics Principles of interaction of circuitry Principles of A.M. radio receivers Principles of A.M. radio transmitters Magnetic fields of force [induction]	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor capacitor] Addition and subtraction of decimal fractions Multiplication and division of decimal fractions [cost of repairs]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams Interpret repair warranty	Comprehension, detail/inference, information report, description of mechanism, definition, terminology, instructions
Writing	List parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

(TASK STATEMENT) REPAIR R.F. AMPLIFIER–OSCILLATOR

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list Radio-TV standard bench: Work bench VTVM, vacuum tube voltmeter Multimeter Signal generator, radio frequency Oscilloscope Isolation transformer Battery eliminator Signal tracer Vacuum cleaner Tube tester Transistor tester Capacitor checkers	Select appropriate technical data Visually inspect and correct obvious defect Performance test and troubleshoot Identify faulty component (s) Remove and replace faulty components Perform alignment	Hazard-Personal Hazardous voltages-electrical shock Heat burns-hot components Safety-Personal Avoid direct contact with voltage sources Avoid physical contact with heat sources Hazard-Equipment Damage to solid-state devices when soldering Safety-Equipment Dissipate heat from solid-state devices when soldering

DECISIONS	CUES	ERRORS
Select replacement parts Determine proper operation	No send, receive OK No send, no receive Send incorrect frequency Poor sensitivity Poor selectivity Oscillation Hum Buzz Distorted sound	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR R.F. AMPLIFIER–OSCILLATOR

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on state of matter (Change of matter from one form to another) [solid-state devices] Resistance of materials to flow of electrical current Principles of oscillators Principles of transistor amplifiers Principles of ohms law Principles of electric power Principles of vacuum tube amplifiers Vacuum tube characteristics Solid-state device characteristics Principles of interaction of circuitry Magnetic fields of force [induction]	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instruments] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor capacitor] Addition and subtraction of decimal fractions Multiplication and division of decimal fractions [cost of repairs]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams Interpret repair warranty	Comprehension, detail/inference, information report, description of mechanism, definition, terminology, instructions
Writing	List parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

(TASK STATEMENT) REPAIR DETECTOR CIRCUIT

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY - HAZARD
Radio-TV repair hand tool list Radio-TV standard bench: Work bench VTVM, vacuum tube voltmeter Multimeter Signal generator, audio frequency Signal generator, radio frequency Oscilloscope Isolation transformer Battery eliminator Signal tracer Tube tester Transistor tester Capacitor checkers Resistor substitution box Capacitor substitution box Vacuum cleaner	Select appropriate technical data Visually inspect and correct obvious defects Performance test and troubleshoot Identify faulty components Remove and replace faulty components	Hazard-Personal Hazardous voltages-electrical shock Heat burns-hot components Safety-Personal Avoid direct contact with voltage sources Avoid physical contact with heat sources Hazard-Equipment Damage to solid-state devices when soldering Safety-Equipment Dissipate heat from solid-state devices when soldering
DECISIONS Select replacement parts Determine proper operation	Sound distortion Weaker or no sound Noise	**ERRORS** Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good component Unnecessary replacement of good components

(TASK STATEMENT) REPAIR DETECTOR CIRCUIT

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on state of matter (Change of matter from one form to another) [solid-state devices] Resistance of materials to flow of electrical current Principles of ohms law Principles of electric power Vacuum tube characteristics Solid-state device characteristics Principles of interaction of circuitry Half-wave rectification Filtering principles Principles of A.M. radio receivers Principles of A. M. radio transmitters	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor, capacitor] Addition and subtraction of decimal fractions Multiplication and division of decimal fractions [cost of repairs]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams Interpret repair warranty	Comprehension, detail/inference, information report, description of mechanism, definition, terminology, instructions
Writing	List parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity of expression, logic

(TASK STATEMENT) REPAIR SQUELCH CIRCUIT

TOOLS, EQUIPMENT, MATERIALS, OBJECTS ACTED UPON	PERFORMANCE KNOWLEDGE	SAFETY – HAZARD
Radio-TV repair hand tool list Radio-TV standard bench: Work bench VTVM, vacuum tube voltmeter Signal generator, audio frequency Signal generator, radio frequency Oscilloscope Isolation transformer Battery eliminator Signal tracer Vacuum cleaner Tube tester Transistor tester Capacitor checkers Resistor substitution box Capacitor substitution box	Select appropriate technical data Visually inspect and correct obvious defect Performance test and troubleshoot Identify faulty components Remove and replace faulty components	Hazard-Personal Hazardous voltages-electrical shock Heat burns-hot components Safety-Personal Avoid direct contact with voltage sources Avoid physical contact with heat sources Hazard-Equipment Damage to solid-state devices when soldering Safety-Equipment Dissipate heat from solid-state devices when soldering
DECISIONS	**CUES**	**ERRORS**
Select replacement parts Determine proper operation	Noise with absence of R.F. carrier No sound Distorted sound Squelch does not respond to control	Action fails to correct malfunction Excessive labor cost for trouble-shooting Accidental damage to good components Unnecessary replacement of good components

(TASK STATEMENT) REPAIR SQUELCH CIRCUIT

SCIENCE	MATH – NUMBER SYSTEMS
Effect of heating and cooling on state of matter (Change of matter from one form to another) [solid-state devices] Resistance of materials to flow of electrical current Principles of transistor amplifiers Principles of ohms law Principles of vacuum tube amplifiers Principles of interaction of circuitry Vacuum tube characteristics Solid-state device characteristics	Given an instrument of measure, determine precision and/or accuracy with respect to manufacturer's specifications [test instrument scales] Given a coding system, recognize and identify each unit involved by assigning necessary symbols, numerical or literal [resistor, capacitor] Addition and subtraction of decimal fractions Multiplication and division of decimal fractions [cost of repairs]

COMMUNICATIONS

PERFORMANCE MODES	EXAMPLES	SKILLS/CONCEPTS
Reading	Interpret equipment specifications Technical reference manuals Interpret schematic diagrams Interpret repair warranty	Comprehension, detail/inference, information report, description of mechanism, definition, terminology, instructions
Writing	List parts and services for billing	Classification, description
Speaking	Explain repair warranty	Terminology, enunciation, clarity logic

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RADIO-TV REPAIR HAND TOOL LIST (BASIC)

1 Standard screwdrivers
2 Jewelers screwdrivers
3 Phillips screwdrivers
4 Tweezers
5 Allen wrenches
6 Needle nose pliers
7 Hammer and punch
8 Wire strippers
9 Soldering iron and solder
10 1-inch brush
11 Nut drivers
12 Alignment tools (non-metallic)
13 Solder aid
14 Tube puller
15 Cheater cord
16 Safety goggles
17 Desoldering tool

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RADIO-TV STANDARD BENCH

1 Work bench
2 VTVM, vacuum tube voltmeter
3 Multimeter
4 Signal generator, audio frequency
5 Signal generator, radio frequency
6 Color bar generator
7 Oscilloscope
8 Isolation transformer
9 Battery eliminator
10 0-400 V. D.C. Power supply
11 UHF-VHF TV antenna
12 Signal tracer
13 Vacuum cleaner
14 Tube tester
15 Transistor tester
16 Capacitor checkers
17 Sweep signal generator with markers
18 TV signal substituter
19 Resistor substitution box
20 Capacitor substitution box
21 Cathode ray tube tester
22 Color TV test jig
23 TV tuner substitute

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